

A survey on Anthomedusae (Hydrozoa: Hydroidomedusae) from the Taiwan Strait with description of new species and new combinations

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Abstract

New data on Anthomedusae are included. Seven new species and 2 new combinations are described. An additional *Teissiera polypofera* Xu, Huang and Chen, 1991 is redescribed and its position of taxonomy is discussed. Other lists of species on Anthomedusae are summarized.

Key words: Anthomedusae, taxonomy; Bougainvillidae, Pandeidae, Protiaridae, Tessieridae, Zancleidae

1 Introduction

This report provides a systematization of the Anthomedusae collected from the Minnan-Taiwan Bank fishing ground upwelling region, the Luoyuan Bay, and the varied island waters of Fujian from 1985 to 2001. The Anthomedusae represents 88 species belonging to 21 families, 42 genus. Seven new species (see Table 1) are described, i.e., *Bougainvillia longistyla* n. sp., *Koellikerina staurogaster* n. sp., *Nubiella atentaculata* n. sp., *Leuckartiara jianyinensis* n. sp., *Leuckartiara neustona* n. sp., *Halitiara obtusus* n. sp., and *Halitiarell apicea* n. sp. In addition, two new combinations are revised, i. e., *Merga minutum* (Xu, Huang and Chen, 1991) transl. nov., *Zanclea macrocystae* (Xu, Huang and Chen, 1991) transl. nov. *Teissiera polypofera* Xu, Huang and Chen, 1991 is redescribed and

its position of taxonomy is discussed. The present paper uses this material to update the Anthomedusae in our previous monograph. All type specimens are deposited in the Department of Oceanography, Xiamen University.

2 Account of species

Family Bougainvillidae Lütken, 1850

Bougainvillia longistyla n. sp. (see Fig. 1)

Umbrella nearly hemispherical, height: 1.0~1.5 mm, width: 1.2~2.0 mm; apex rounded, with mesoglea thick at apex, thinning towards the lateral walls; stomach quadrangular, very flat, adnate to subumbrella, without peduncle and mouth tubular, with simple circular mouth, rim thicker, with 4 perradial oral tentacles, divided dichotomously 3 or 4 times, inserted distinctly above mouth rim and armed with cnidocyst clusters, oral tentacles with very long basal trunks, about 5/6 as long as oral tentacles,

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Table 1. List of species on Anthomedusae (1962-2003)

| | Continued from Table 1 |
|--|---|
| Class Hydroidomedusae Claus, 1877 | Genus <i>Rathkea</i> Brandt, 1838 |
| emend (Bouillon and Boero, 2000) | <i>R. octopunctata</i> (M. Sars, 1835) |
| Subclass Anthomedusae Haeckel, 1879 | Suborder Pandeidae Haeckel, 1879 |
| Order Filifera Kühn, 1913 | Family Bythotiaridae Maas, 1905 (=Calycopsidae) |
| Suborder Margelina Haeckel, 1879 | Genus <i>Heterotiar</i> Maas, 1905 |
| Family Australomedusidae Russell, 1971 | <i>H. minor</i> Vanhöffen, 1911 |
| Genus <i>Platystoma</i> Zhang, 1982 | Genus <i>Gymnogonium</i> Xu and Huang, 1994 |
| <i>P. bitentaculata</i> Xu, Huang and Chen, 1991 | <i>G. zhengzhongii</i> Xu and Huang, 1994 |
| <i>P. dongshanensis</i> Xu and Huang, 1994 | Family Niobiidae Petersen, 1979 |
| <i>P. nanhaiensis</i> Zhang, 1982 | Genus <i>Niobia</i> Mayer, 1900 |
| Family Bougainvillidae Lütken, 1850 | <i>N. dendrotentaculata</i> Mayer, 1900 |
| Genus <i>Bougainvillia</i> Lesson, 1830 | Family Pandeidae Haeckel, 1879 |
| <i>B. bitentaculata</i> Uchida, 1925 | Genus <i>Amphinema</i> Haeckel, 1879 |
| <i>B. britannica</i> (Forbes, 1841) | <i>A. australis</i> (Mayer, 1900) |
| <i>B. fulva</i> Agassiz and Mayer, 1899 | <i>A. dinema</i> (Péron and Lesueur, 1810) |
| <i>B. longistyla</i> n. sp. | <i>A. physophorum</i> (Uchida, 1927) |
| <i>B. niobe</i> Mayer, 1894 | <i>A. rugosum</i> (Mayer, 1900) |
| <i>B. paraplatygaster</i> Xu, Huang and Chen, 1991 | <i>A. turrida</i> (Mayer, 1900) |
| <i>B. platygaster</i> (Haeckel, 1879) | Genus <i>Cirrhitiara</i> Hartlaub, 1913 |
| <i>B. ramosa</i> (van Beneden, 1844) | <i>C. simplex</i> Xu, Huang and Chen, 1991 |
| Genus <i>Koellikerina</i> Kramp, 1939 | Genus <i>Leuckartiara</i> Hartlaub, 1914 |
| <i>K. constricta</i> (Menon, 1932) | <i>L. hoepplii</i> Hsu, 1928 |
| <i>K. diforficulata</i> Xu and Zhang, 1978 | <i>L. jianyinensis</i> n. sp. |
| <i>K. fasciculata</i> (Péron and Lesueur, 1810) | <i>L. neustona</i> n. sp. |
| <i>K. heteronemalis</i> Xu, Huang and Chen, 1991 | <i>L. octona</i> (Fleming, 1823) |
| <i>K. staurogaster</i> n. sp. | <i>L. orientalis</i> Xu, Huang and Chen, 1991 |
| <i>K. taiwanensis</i> Xu, Huang and Chen, 1991 | Genus <i>Merga</i> Hartlaub, 1914 |
| Genus <i>Nemopsis</i> L. Agassiz, 1849 | <i>M. macrobulbosa</i> Xu, Huang and Chen, 1991 |
| <i>N. bachei</i> L. Agassiz, 1849 | <i>M. minutum</i> (Xu, Huang and Chen, 1991), |
| <i>N. hexacanal</i> Huang and Xu, 1994 | transl. nov. |
| Genus <i>Nubiella</i> Bouillon, 1980 | <i>M. tergestina</i> (Neppi and Stiasny, 1912) |
| <i>N. atentaculata</i> n. sp. | Genus <i>Pandea</i> Lesson, 1843 |
| Family Clavidae McCrady, 1859 | <i>P. conica</i> (Quoy and Gaimard, 1827) |
| Genus <i>Turritopsis</i> McCrady, 1859 | Genus <i>Pandeopsis</i> Kramp, 1959 |
| <i>T. lata</i> Ledenfeld, 1884 | <i>P. ikarii</i> Kramp, 1959 |
| <i>T. nutricula</i> McCrady, 1859 | Family Proboscidiactylidae Hand and Hendrickson, 1950 |
| Family Cytaeidae L. Agassiz, 1829 | Genus <i>Proboscidiactyla</i> Brandt, 1834 |
| Genus <i>Cytaeis</i> Eschscholtz, 1829 | <i>P. ornate</i> (McCrady, 1859) |
| <i>C. tetrastyla</i> Eschscholtz, 1829 | Family Protiaridae Haeckel, 1879 |
| Family Hydractiniidae L. Agassiz, 1862 | Genus <i>Halitiara</i> Fewkes, 1882 |
| Genus <i>Hydractinia</i> van Beneden, 1841 | <i>H. obtusus</i> n. sp. |
| <i>H. apicata</i> Kramp, 1959 | Genus <i>Halitiarella</i> Bouillon, 1980 |
| <i>H. carnea</i> M. Sars, 1846 | <i>H. apicea</i> n. sp. |
| <i>H. minima</i> (Trinci, 1903) | Genus <i>Lalitiara</i> Xu and Huang, 1990 |
| Family Rathkeidae Russell, 1953 | <i>L. orientalis</i> Xu and Huang, 1990 |
| Genus <i>Allorathkea</i> Schmidt, 1972 | Genus <i>Paratiara</i> Kramp and Damas, 1925 |
| (= <i>Pseudorathkea</i> Xu and Huang, 1990) | <i>P. digitalis</i> Kramp and Damas, 1925 |
| <i>A. macrogastrica</i> (Xu and Huang, 1990) | Order Capitata Kühn, 1913 |

To be continued

To be continued

Continued from Table 1

- Suborder Moerisiida Poche, 1914
 Family Moerisiidae Poche, 1914
 Genus *Moerisia* Boulenger, 1908
M. inkermanica
 (Paltschikowa-Ostroumova, 1925)
 Genus *Odessia* Paspaleff, 1937
O. microtentaculata Xu, Huang and Chen, 1991
 Family Halimedesidae Arai and Brinckmann-Voss, 1980
 Genus *Tiaricodon* Browne, 1902
T. coeruleus Browne, 1902
 Family Hydrocorynidae Rees, 1951
 Genus *Hydrocoryne* Stechow, 1907
H. miurensis Steckow, 1907
 Suborder Tubulariida Fleming, 1828
 Family Corynidae Johnston, 1836
 Genus *Dicodonium* Haeckel, 1879
D. jeffersoni (Mayer, 1990)
 Genus *Dipurena* McCrady, 1859
D. strangulata McCrady, 1859
 Family Corymorphidae Allman, 1872
 Genus *Euphysora* Maas, 1905
E. abaxialis Kramp, 1962
E. apiculoculifera Xu and Huang, 2003
E. bigelowi Maas, 1905
E. brunnescentis Huang, 1999
E. crassocanalus Xu and Huang, 2003
E. interrogona Xu and Huang, 2003
E. knides Huang, 1999
E. macrobulbus Xu and Huang, 2003
E. solidonema Huang, 1999
E. taiwanensis Xu and Huang, 2003
E. verrucosa Bouillon, 1978
 Genus *Vannuccia* Brinckmann-Voss, 1967
V. forbesii (Mayer, 1894)

To be continued

Continued from Table 1

- Family Euphysidae Haeckel, 1879
 Genus *Cnidocodon* Bouillon, 1978
C. xiamenensis (Zhang and Wu, 1981)
 Genus *Euphysa* Forbes, 1848
E. aurata Forbes, 1848
 Genus *Euphysilla* Kramp, 1955
E. pyramidata Kramp, 1955
 Genus *Euphysomma*, 1962
E. brevia Uchida, 1947
 Family Tubulariidae Fleming, 1828
 Genus *Ectopleura* L. Agassiz, 1862
E. dumortieri (van Beneden, 1844)
E. guangdongensis Xu, Huang and Chen, 1991
E. latitaeniata Xu and Zhang, 1978
E. minerva Mayer, 1900
E. sacculifera Kramp, 1957
E. xiamenensis Zhang and Lin, 1984
 Genus *Hybocodon* L. Agassiz, 1862
H. prolifer L. Agassiz, 1862
 Suborder Zancleida Russell, 1953
 Family Porpitidae Goldfuss, 1818
 Genus *Porpita* Lamarck, 1801
P. porpita (Linnaeus, 1758)
 Genus *Verella* Lamarck, 1801
V. verrella (Linnaeus, 1758)
 Family Tesieridae Bouillon, 1974
 Genus *Teissiera* Bouillon, 1974
T. australe Bouillon, 1978
T. polyopfera Xu, Huang and Chen, 1991
T. medusifera Bouillon, 1978
 Family Zancleidae Russell, 1953
 Genus *Zanclea* Gegenbaur, 1857
Z. costata Gegenbaur, 1857
Z. macrocystae
 (Xu, Huang and Chen, 1991), transl. nov.

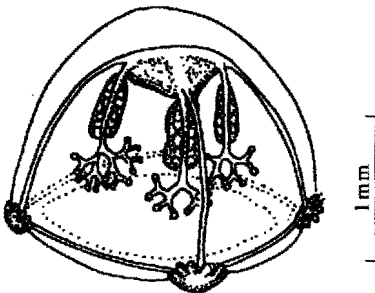


Fig. 1. *Bougainvillia longistyla* n. sp.

length of whole oral tentacle almost extending to umbrella margin; upside of 4 elliptic-like go-

nads connected to perradial stomach wall, downside extending along the oral tentacles basal trunk to upside of oral tentacles dichotomously; from lateral view, each gonad looking like hanging down in subumbrella cavity; with 4 radial canals and ring canal; 4 radially placed tentacular bulbs, each bearing 4-6 clusters of solid marginal tentacles, without ocelli; velum narrow.

This new species has radially placed clusters of solid marginal tentacles; the tentacle of

each cluster all alike; with 4 perradial oral tentacles dichotomously branching; gonad on manubrium in perradial position; without ocelli. So it belongs to *Bougainvillia* Lesson, 1830. At the present time only 22 valid species in the *Bougainvillia* are known. This new species with very flat stomach, quadrangular, without peduncle, differs from the other species in this genus, but similar to *B. platygaster* (Haeckel, 1879) and *B. paraplatygaster* Xu, Huang and Chen, 1991. A comparison of these two species with our new species is given in Table 2.

Type specimens: holotype, No. AOB-HL125; paratype, No. AOB-HL126. Two speci-

mens were collected from the southern part of the Taiwan Strait in September 1988.

with short and thick trunks, divided into 3 bifurcations, with very short branches, each with a terminal nematocyst knob; 4 broad radial canals and ring canal; velum development; with 8 groups of marginal tentacles, all alike in structure, with 5 marginal tentacles in each perradial, 3 in each interradial group; perradial bulbs triangular, larger, about 1.5 times as long as interspaces, interradial bulbs small, linear, about 3 times as long as interspaces, all tentacles bulbs abaxial with dark-red ocelli.

This new species has 8 groups of marginal tentacles, 4 perradial and 4 interradial, all alike in structure; with 4 perradial oral tentacles,

Table 2. Comparison of main shape characteristics of 3 species of *Bougainvillia*

| Characteristic | <i>B. paraplatygaster</i> | <i>B. platygaster</i> | <i>B. longistyla</i> n. sp. |
|----------------|---|--|---|
| Umbrella | nearly globe-shape, mesoglea thick | globe-shape, mesoglea thick | nearly hemispherical, mesoglea thick |
| Manubrium | no peduncle and mouth tubular | no peduncle, with mouth tubular | no peduncle and mouth tubular |
| Gonads | perradial, extending along adradial sides of stomach, smooth | interradial, short and flat, with medusa buds and polyoid buds | perradial, upside of gonads connected to stomach wall, downside extending along oral tentacle basal trunk to upside of dichotomously branch |
| Oral tentacles | very short trunk, 4 thick cluster of oral tentacles, each with 4 main oral tentacles, 6~7 times | short, divided 5~6 times immediately from base | very long trunk, about 5/6 as long as oral tentacles, divided 3~4 times |
| Marginal bulbs | kidney-shape, with 14~17 tentacles | triangular, with 10~13 tentacles | kidney-shape, with 4~6 tentacles |
| Ocelli | present | present | none |

Koellikerina staurogaster n. sp. (see Fig. 2)

Umbrella nearly ovaliform, with thick jelly, apex rounded, height: 1.8 mm, width: 1.5 mm; manubrium without peduncle, with short and thick mouth tubular, from facing dorsal view, stomach cruciform (see Fig. 2b), with simple circular mouth; with 4 perradial, elliptic-like gonads, smooth, slightly extending outwards along the radial canals; 4 perradial oral tentacles

divided into 3 bifurcations; gonads on manubrium perradial, so they belong to *Koellikerina* Kramp, 1939. At the present time, only 10 valid species in *Koellikerina* are known. This new species umbrella has no apical projection, manubrium without peduncle, with short and thick mouth tubular, stomach cruciform; these features differ from all *Koellikerina* species, but the closest species is *K. massi* (Browne, 1910) and *K. multicirrata* (Kramp, 1928). *K. massi* also has stomach cross-shaped, though they are

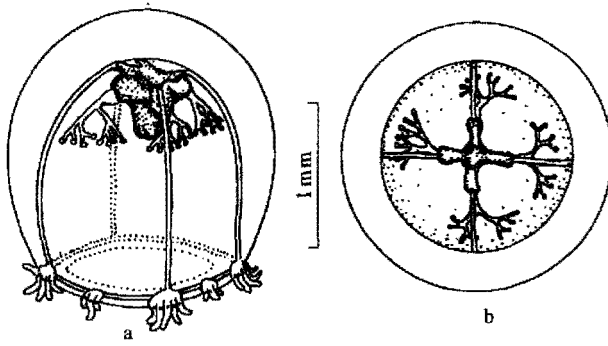


Fig. 2. *Koellikerina staurogaster* n. sp. a. Lateral view and b. facing dorsal view.

gonad 4 masses, covering nearly the whole interradial wall of stomach; 4 oral tentacle divided 7-8 times; 8 marginal groups of 5-7 tentacles each; no ocelli; *K. multicirrata* has stomach short without cross-shaped; gonads perradial, V-shaped, each with 1 median and 2-3 pairs of lateral folds; oral tentacles divide 6-7 times, or more; marginal bulbs linear, broader than interspaces, each with 12-16 tentacles; with ocelli. These features differ from *K. staurogaster* n. sp., as follows: with stomach cruciform; with 4 perradial, elliptic-like gonads, smooth, slightly extending outwards along the radial canals; oral tentacle divided into 3 bifurcations; perradial bulbs larger, triangular, with 5 tentacles, interradial bulbs small, linear, with 3 tentacles, all tentacles bulbs with ocelli (see Table 3).

Type specimens: holotype, No. AOB-HL 127. One specimen was collected from the southern part of the Taiwan Strait in July 1988.

Nubiella atentaculata n. sp. (Fig. 3)

Umbrella bell-shaped, 2 mm high, 1.5 mm wide, with slight rounded top, mesoglea thick especially in the apical region, thinning gradually toward umbrella margin; subumbrella cavity spacious, presenting 4 apical interradial conical projections into the apical mesoglea; stomach elliptic-like, about 1/3 the length of subumbrella cavity; mouth simple, without lips, surrounded by conspicuous ring of dark-brown pigment; with 12 simple unbranched oral

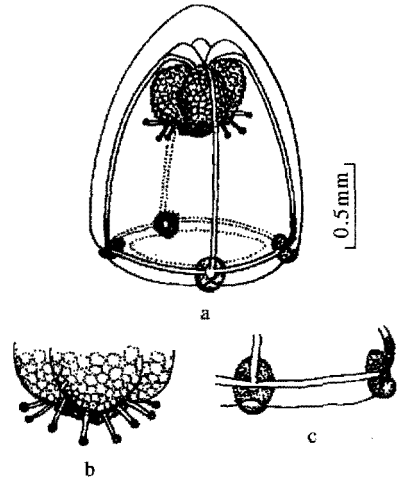


Fig. 3. *Nubiella atentaculata* n. sp. a. Lateral view, b. enlargement of gonad and oral tentacle and c. detail of marginal bulb.

tentacles, rising well above mouth rim and armed with cnidocyst cluster; velum moderately broad; 4 radial canal and ring canal conspicuous; 4 large, ovaliform gonads situated on the perradial of the stomach and extending toward interradial, scattered numerous round, granulose sex cell on the gonads, the outline of each gonad resembling a "berryfruit"; 4 perradial marginal bulbs, differing in size and structure, of which 2 opposite bulbs are smaller than the others, with a short club-shaped endodermal process, extending slightly upwards from the basal bulbs into radial canal, surface of club-shaped process with brown pigment, all marginal bulbs elliptic-like, from subumbrella

Table 3. Comparisons between the different species of the genus *Koellikerina*

| Species | Apical projection | Shape of manubrium | Number and position of gonads | Size of oral tentacles trunk | Number of oral tentacle dichotomously | Number of each cluster marginal tentacles | Shaped of tentacle bulbs tentacle | Interspaces of between bulbs | Ocelli |
|--------------------------------|--|---|--|------------------------------|---|---|--|------------------------------|---------|
| <i>Koellikerina constricta</i> | present | short peduncle, stomach globular | 4 perradial, 3 pair of lateral folds | slender | 6~7 | 7~8 | triangular | 1/2 as broad as interradial | present |
| <i>K. diforficulata</i> | none | short peduncle, stomach large, broad | 4 perradial 3~4 transversal folds | short, thick | 2 | 5 | linear | narrow | present |
| <i>K. fasciculata</i> | none | short, broad peduncle | 4 perradial, horseshoe-shaped, with 9~10 transverse furrows | slender, short | 6~8 | up to 23 | triangular | narrow | present |
| <i>K. elegans</i> | none | slender, conical peduncle, stomach pear-shaped | 4 interradial, smooth | short, thick | divided 3 times, each tip with 3 small branches with nematocysts | 4 perradial, 3 interradial | triangular | narrow | present |
| <i>K. heteronemalis</i> | present | short, conical peduncle, stomach very flat | 8 adradial, ovaliform, no folds | short, thick | 5~6 | 5 | kidney-shaped | broad | present |
| <i>K. maasi</i> | none | without peduncle, stomach large, crossshaped | 4 interradial, mass-shaped | short, thick | 7~8 | 5~7 | triangular | narrow | none |
| <i>K. multicirrata</i> | none | no peduncle, stomach short | 4 perradial, V-shaped, 2~3 pairs lateral folds | long, thick | 6~7 or more | 12~16 | linear | narrow | present |
| <i>K. octonemalis</i> | none | stomach upon a short, wide, conical peduncle | 4 interradial, doubly cleft, smooth | very short | 4~5 | 7~9 perradial, 5~7 interradial | small triangular | broader | present |
| <i>K. ornata</i> | presenting a large orange patch at tip | slender peduncle, mouth tube long and slender, stomach doliform folds | 4 perradial, elongated horseshoe-shaped, 4~5 lateral folds | unknow | 5~6 | 11~13, each bulb with 2 bright orange abaxial spots | linear | narrow | present |
| <i>K. taiwanensis</i> | presenting a large globose at tip | short peduncle, stomach bowl-shaped | 8 adradial, 3~4 oblique split folds each | very short | 4 clusters, each with 4 main oral tentacles, each with 4~5 branches | 12~14 perradial, 8~10 interradial | linear perradial and interradial tentacle bulbs unequal size | narrow | present |
| <i>K. staurogaster</i> n. sp. | none | no peduncle, with short and thick mouth tube, stomach cruciform | 4 perradial, elliptic-like smooth, extending outwards radial canal | short, thick | 3 | 5 perradial, 3 interradial | triangular in perradial, linear in interradial | broad | present |

margin slightly clasping the exumbrella margin, without developed tentacles; without ocelli.

This new species has simple unbranched oral tentacles; with 4 marginal bulbs, placing this medusa in the genus *Nubiella* Bouillon, 1980. At the present time, only 1 species in the *Nubiella* is known: *N. mitra* Bouillon, 1980, with 4 simple unbranched oral tentacles; with 4 solitary marginal tentacles but all of the same structure; and medusa buds surrounding stomach wall. These features differ from *N. atentaculata* n. sp., as follows: with 12 simple unbranched oral tentacles; with 4 perradial marginal bulbs differing in size and structure, of which 2 opposite bulbs have a short club-shaped endodermal process, extending slightly upwards from the basal bulbs into radial canal; 4 perradial gonads, "berryfruit" like; all marginal bulbs without developed tentacles.

Type specimens: holotype, No. AOB-HL 128. One specimen was collected from the southern part of the Taiwan Strait in December 1987.

Family Pandeidae Haeckel, 1879

Leuckartiara jianyinensis n. sp. (Fig. 4)

Umbrella bell-shaped, with a large, solid, globular apical projection not exceeding 1/2 of the height of the bell, height: 10 mm (including the apical projection); width: 7.5 mm; stomach large

and broad, almost occupying the whole subumbrella cavity, but not exceeding velar opening, 2/3 of the height of the manubrium connected to the radial canals by mesenteries, mouth quadrangular, with short, folded, crenulata lips; 4 horseshoe-shaped, interradial gonads, each with two adradial series of 4-5 transverse folds directed towards the perradii, connected by 2 transverse bridges situated in the middle of the gonad; 4 broad radial canals, slightly jagged; ring canal narrows; 4 marginal tentacles, perradial, hollow, long, laterally compressed, each bearing a conspicuous short abaxial spur, with ocelli; 1 interradial, short, filiform, rudimentary tentacles in between successive tentacles, completely adnate to the exumbrellar margin, abaxial ocelli on the terminal each rudimentary tentacles; velum narrow.

This new species has a manubrium connected to radial canals by mesenteries; its gonads are interradial and typically horseshoe-shaped. So it belongs to *Leuckartiara* Hartlaub, 1914. At the present time only 15 valid species in *Leuckartiara* are known. This new species can easily be distinguished from the other species of *Leuckartiara* by 2 main characteristics: 4 short, filiform, interradial rudimentary tentacles, completely adnate to the exumbrellar margin; 2 adradial series of gonads, connected by 2 transverse bridges situated in the middle of the gonad; other less specific characteristics are the shape of apical projection, number of marginal tentacles, and the length of mesenteries. The closest species is *L. brownei* Larson and Harbison, 1990, which also has filiform rudimentary tentacles and 4 developed tentacles, though they are umbrella margin with 28 long filiform tentacles, grow in succession, and clasp the exumbrella, without ocelli on the terminal (see Table 4).

Type specimens: holotype, No. AOB-HL 129. One specimen was collected from the southern part of Jianyin Islands waters of Fujian in August 1990.

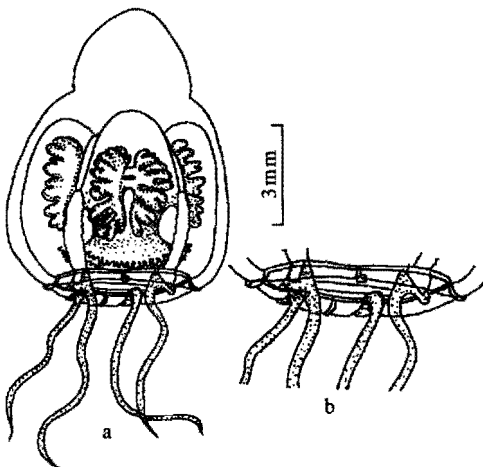


Fig. 4. *Leuckartiara jianyinensis* n. sp.

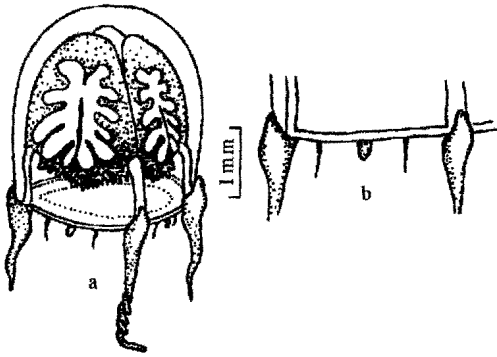
Leuckartiara neustona n. sp. (Fig. 5)

Fig. 5. *Leuckartiara neustona* n. sp. a. Side view and b. enlargement of umbrella margin.

Umbrella bell-shaped without apical projection, height: 3.0 mm, width: 2.0 mm, stomach large and broad, almost filling the subumbrella cavity, but not extending beyond the umbrellar margin; mouth broad and large, quadrangular, with short, folded, crenulate lips; 4 horseshoe-shaped, interradial gonads each with 2 adradial series of 5~6 transversal folds slightly obliquely downwards towards the perradii, the adradial parts interradially connected in the uppermost part of the gonad, 2/3 of the height of the manubrium connected to the radial canals by mesenteries; 4 medial broad radial canals without jagged margins; ring canal narrows; 4 well developed hollow marginal tentacles, tentacles bulbs laterally compressed, with distinct abaxial spurs, none ocelli; 2 adradial, short, filiform, rudimentary tentacles, without ocelli, and 1 interradial, club-shaped marginal rudimentary bulbs, with abaxial red ocelli on tentacular bulbs in between successive perradial marginal tentacles; velum broad.

This new species has a manubrium connected to radial canals by mesenteries; its mouth has a crenulated margin; its gonads are interradial and typically horseshoe-shaped, allowing its inclusion in the *Leuckartiara*. Main characteristics of this new species are: umbrella with-

out apical projection; 4 developed marginal tentacles, bulbs without ocelli; 2 adradial, short, filiform, rudimentary tentacles without ocelli, and 1 interradial, club-shaped marginal rudimentary bulbs with ocelli in between successive perradial marginal tentacles. The closest species is *L. octona* (Fleming, 1823), which also has 1~3 club-shaped marginal rudimentary bulbs, though they are umbrella with apical projection, umbrella margin with 12~32 developed tentacles, without adradial filiform rudimentary tentacles (see Table 4).

Type specimens: holotype, No. AOB-HL 130. One specimen was collected with the *Manta neustox* net from the southern part of the Taiwan Strait in August 1988.

Merga minutum (Xu, Huang and Chen, 1991) transl. nov. (Fig. 6).

Halitiarella minutum Xu, Huang and Chen, 1991, 475~476, Figs 9a-b.

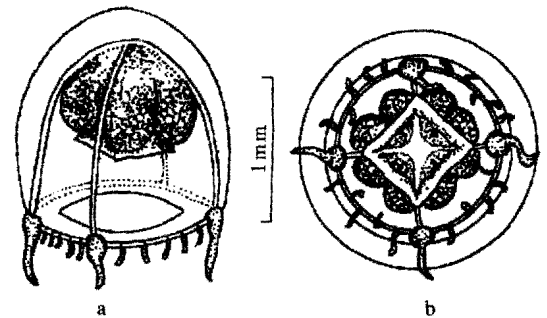


Fig. 6. *Merga minutum* (Xu, Huang and Chen, 1991) transl. nov. a. Side view and b. facing oral view.

Xu, Huang and Chen (1991) described a *Halitiarella minutum* with 8 adradial gonads at the manubrium. It does not belong to the genus *Halitiarella*. According to the number and position of gonads, tentacles structure and long mesenteries of *Halitiarella minutum* allow its inclusion in the genus *Merga*, family Pandeidae.

At the present time, only 6 species in the *Merga* are known. This medusa's main characteristics are as follows: umbrella without api-

Table 4. The key to the world species of Genus *Leuckartiara*

-
- 1 exumbrella with longitudinal canal-like bands or ribs = 2
- 1a exumbrella without longitudinal canal-like bands or ribs = 3
- 2 with 4 large perradial and 8~12 smaller tentacles of varying size; no distinct apical projection; horseshoe fold in the uppermost part of gonads = *L. zacaе* Bigelow 1940
- 2a with only 4, perradial tentacles and some minute tentaculates; with conical apical projection; transverse bridge in the middle part of gonads = *L. gardineri* Browne 1916
- 3 umbrella margin with filiform rudimentary tentacles = 4
- 3a without filiform rudimentary tentacles = 9
- 4 filiform rudimentary tentacles clasp or adnate to the exumbrella = 5
- 4a filiform rudimentary tentacles without clasp or adnate to the exumbrella = 8
- 5 with 4 developed tentacles = 6
- 5a with up to 8 developed tentacles = 7
- 6 28 long, filiform, rudimentary tentacles grow in succession, and clasp the exumbrella, without ocelli on the terminal = *L. brownie* Larson and Harbison 1990
- 6a 4 short, filiform, rudimentary tentacles, adnate to exumbrella, abaxial ocelli on the terminal = *L. jianyinensis* n. sp
- 7 with 8 large tentacles, with elongated bulbs, with short abaxial spurs, other with 8 small adradial, filiform tentacles, their proximal part adnate to umbrella margin and continued upwards on exumbrella = *L. annexa* (Kramp, 1957)
- 7a 20~23 large tentacles with laterally compressed elongated bulbs, no abaxial spurs, up to 3 rudimentary tentacles between adjacent tentacles completely adnate to exumbrella ridges nearly to summit = *L. adnata* Pages, Gieei and Bouillon, 1992
- 8 with 8 well developed tentacles, with 24 very short rudimentary tentacles each with a small median cirrus = *L. hoepplii* Hsu, 1928
- 8a 4 perradial tentacles, equal size, 2 adradial short, filiform, rudimentary tentacles and 1 interradial, club-shaped marginal rudimentary bulbs in between successive tentacles = *L. neustona* n. sp.
- 9 with well developed apical projection = 10
- 9a without well developed apical projection = 15
- 10 developed tentacles bulbs with abaxial spurs = 11
- 10a developed tentacles bulbs without abaxial spurs = 12
- 11 4 developed tentacles, 4 interradial rudimentary bulbs = *L. simplex* Bouillon, 1980
- 11a with 12~32 developed tentacles, with 1~3 club-shaped marginal rudimentary bulbs in between adjacent tentacles = *L. octona* (Fleming, 1823)
- 12 all tentacles of equal structure = 13
- 12a all tentacles of unequal structure, with tentacular rudiments between the large tentacles = 14.
- 13 about 40 tentacles of varying size, with ocelli = *L. nobilis* Hartlaub, 1913.
- 13a 100 or more densely crowded tentacles, without ocelli = *L. brevicornis* (Murbach and Shearer, 1902).
- 14 4 perradial, 4 interradial, 1~3 marginal bulbs between successive tentacles = *L. foersteri* Arai and Brinckmanvoss, 1980
- 14a 2 long tentacles issued from voluminous laterally compressed bulbs; 2 short tentacles issued from small conical not compressed bulbs; 3 rudimentary tentacles between each successive tentacles = *L. eckerti* Bouillon, 1985
- 15 mesenteries along entire length of stomach = *L. grimaldii* Ranson 1936
- 15a mesenteries along 1/2~1/3 length of stomach = 16
- 16 8 developed tentacles, without abaxial spurs, with ocelli, 1 small rudimentary marginal bulbs between each successive tentacles = *L. orientalis* Xu, Huang and Chen, 1991
- 16a 4 perradial tentacles, no equal size, 2 opposites are better developed than the other 2 without interradial, club-shaped marginal rudimentary bulbs in between successive tentacles = *L. abyssii*, (Go Sars, 1874)
-

cal projection; 8 adradial gonads, smooth, at the manubrium; 1/2 of the height of manubrium connected to the radial canal by mesenteries; 4 perradial tentacles with long conical-shaped

bulbs without ocelli, and 5 club-shaped tentaculates between tentacles, without bulbs, with ocelli. These features differ from those of the other species of *Merga* (Table 5).

Table 5. The key to the species of Genus *Merga*

| | |
|----|--|
| 1 | umbrella with an apical projection = 2 |
| 1a | umbrella without an apical projection = 4 |
| 2 | with 4~8 developed tentacles = 3 |
| 2a | with 16 developed tentacles, tentacles bulbs large, triangular, 4 perradial bulbs with band-haped ocelli, 12 other bulbs with dot-like ocelli, stomach with a well developed neck and strongly folded lips = <i>Merga galleri</i> Anita Brinckmann, 1962 |
| 3 | 4 perradial tentacles, tentacles bulbs large, long cylindrical shaped, 2 tentaculates between tentacles, without bulbs, all tentacles bulbs without ocelli = <i>M. bulbosa</i> Bouillan, 1980 |
| 3a | 4~8 developed tentacles with cylindrical-shaped bulbs, with ocelli, a few very small rudimentary bulbs without ocelli = <i>M. tergestina</i> (Neppi and Stiasny, 1911) |
| 4 | gonad interradial: 4 perradial tentacles with large, conical basal bulbs and 4 interradial, tenon-like tentaculates, = <i>M. reesi</i> Russell, 1956 |
| 4a | gonad adradial, = 5 |
| 5 | 4 perradial tentacles, = 6 |
| 5a | 8~12 long and 24~36 rudimentary tentacles, all with ocelli. = <i>M. violacea</i> (Agassiz and Mayer, 1899) |
| 6 | 4 perradial tentacles with large, globose bulbs, and 4 rudimentary bulbs, all without ocelli. = <i>M. macrobulbosa</i> Xu, Huang and Chen, 1991 |
| 6a | 4 perradial tentacles with long conical-shaped bulbs, without ocelli, and 5 club-shaped tentaculæ between tentacles without bulbs, with ocelli, = <i>M. minutum</i> (Xu, Huang and Chen, 1991) transl. nov |

Family Protiaridae Haeckel, 1879.

Halitiara obtusus n. sp. (Fig. 7)

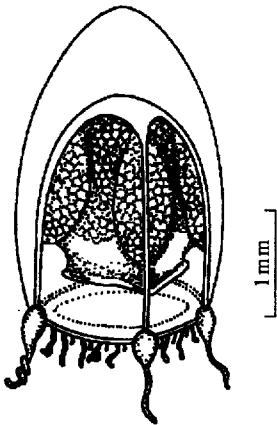


Fig. 7. *Halitiara obtusus* n. sp.

Umbrella 2.6~3.0 mm high, 1.3~1.5 mm wide, apex bluntly, devoid of evidence of apical projection, mesoglea thick especially in the apical region, thinning gradually toward umbrella

margin; manubrium broad and large, about 3/4 the length of subumbrella cavity; mouth simple, broad and large, cruciform opening; 4 perradial, diverticule gastric lobes extending from manubrial wall, the whole length not exceeding mouth rim, 2/3 of the length of the gastric lobes connected to the radial canals by mesenteries; gonad interradial, extending toward perradial diverticule gastric lobes; with 4 straight radial canals, and ring canal; with 4 perradial marginal tentacles, base bulbs conical-shaped, without ocelli; with 5~8 solid, cirrus-like, unequal size marginal tentacles between successive tentacles, without bulbs and ocelli; velum broad.

This new species has 4 straight radial canals; with 4 perradial marginal tentacles and 5~8 solid cirrus-like marginal tentacles; without rudimentary marginal bulbs; mouth simple; with mesenteries; interradial gonads; all ten-

